‘Accessibility 2.0: Next Steps For Web Accessibility

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ABSTRACT

The Web Accessibility Initiative (WAI) was established to enhance the accessibility of Web resources for people with disabilities. In this paper we argue that although WAI’s advocacy work has been very successful, the WAI approach is flawed. Rather than WAI’s emphasis on adoption of technical guidelines, the authors argue that the priority should be for a user-focussed approach, which embeds best practices through the development of achievable policies and processes and which includes all stakeholders in the process of maximising accessibility. The paper describes a tangram model which provides a pluralistic approach to Web accessibility, and provides case studies which illustrate use of this approach. The paper describes work which has informed the ideas in this paper and plans for further work, including an approach to advocacy and education which coins the “Accessibility 2.0” term to describe a renewed approach to accessibility, which builds on previous work but prioritises the importance of the user.

Keywords

Web accessibility, people with disabilities, WAI, WCAG, guidelines, contextual design.

1. THE WAI MODEL

As the body responsible for the coordination of developments to Web standards, the World Wide Web Consortium (W3C) has taken a lead in promoting accessibility of the Web for disabled people, not only as Web users, but also as Web authors. Since 1997, the W3C’s Web Accessibility Initiative (WAI) has been extremely active and very successful both in raising awareness of the importance of Web accessibility and in developing a model which can help organisations in the provision of accessible Web resources. WAI promotes a tripartite model of accessibility, with the goal of universal Web accessibility in theory provided by full conformance with each of three components (Chisholm, 2005). Of particular relevance to developers of Web resources is the Web Content Accessibility Guidelines (WCAG) (W3C, 1999). WAI has been successful in promoting the WCAG around the world; the guidelines have been adopted by many organisations and are increasingly being adopted at a national level (W3C, 2005).

In the WAI model, the WCAG is coupled with accessibility guidelines for browsing and access technologies (the User Agent Accessibility Guidelines, UAAG) (W3C, 2002) and for tools to support creation of Web content (Authoring Tools Accessibility Guidelines, ATAG) (W3C, 2000), complemented by the activities of the Education and Outreach Working Group (EOWG) (W3C, 2007a) and the Protocol and Formats Working Group (PFGW) (W3C, 2006a). This approach acknowledges that in addition to providers of Web content, developers of authoring tools and of browsers, media players and access technologies also have responsibility towards the provision of accessible Web content.

2. LIMITATIONS OF WAI’S APPROACH

2.1 Shortcomings of the WAI Model and WCAG 1.0

The shortcomings of the WAI model and WCAG 1.0 have been documented in detail elsewhere by the authors (Kelly, 2005). Most of the guidelines are still valid for simple sites to this day. However, the fact that this document is now 8 years old is apparent when seeking to develop more complex Web services which comply with these guidelines.

At its core, WCAG 1.0 is very HTML specific. There are a few mentions of CSS and JavaScript, and an admonition to use W3C technologies, which results in a disconnect with the reality of the Web as it stands today. Most, if not all, of the “until user agents...” checkpoints are no longer relevant, although automated testing tools still treat them as such. There are also many ambiguous and not easily testable checkpoints. Applying WCAG

1.0 in a modern context therefore requires a lot of interpretation to make the guidelines applicable.

In theory, these shortcomings should be of limited impact given that work has for several years been ongoing on WCAG 2.0, the replacement for WCAG 1.0, since 2001. WCAG 2.0 represents a fundamental departure from the approach to accessibility taken by the WCAG 1.0 recommendation. In comparison to the HTML-focused WCAG 1.0, WCAG 2.0 is fundamentally "technology-agnostic". Its core principles (POUR: perceivable, operable, understandable, robust), guidelines and related 'success criteria' aim to be applicable to the widest possible range of present and future technologies used to deliver content on the Web – including non-W3C technologies. The normative guidelines are meant to be complemented by non-normative, technology-specific 'techniques' documents, detailing specific implementation examples and best practices, as described in the overview of WCAG 2.0 documents (WC3, 2007b).

The call for review of the WCAG 2.0 Last Call Working Draft was issued in April 2006. This was received in many expert circles with reactions ranging "between the lukewarm and the outright hostile" (Pickard, 2006). In an article that brought WCAG 2.0 to the attention of the wider Web design community, (Clark, 2006) raised (among other issues) fundamental concerns regarding:

- The size of the documentation (normative and non-normative), which, it is argued, will negatively impact adoption by actual designers and developers.
- Its inscrutable language: due to WCAG 2.0's aim to be technologically neutral, the language used for guidelines and success criteria is generic, comprised of vague new terms and definitions.
- The potential for abuse inherent in the concepts of baselines and scoping as a means to justify inaccessible sections of a site and proprietary technologies which present accessibility hurdles to users.
- The omission of markup validation / standards-compliance from the guidelines.
- Lack of adequate provision for users with cognitive disabilities and learning difficulties.

On this last point, Seeman submitted a formal objection to WCAG 2.0, requesting that implicit claims that the guidelines do cover cognitive disabilities be omitted from the guidelines' abstract altogether (Seaman, 2006).

The following year, WAI released a revised version of WCAG 2.0 which, in light of the large numbers of comments which had been made, was downgraded from "Last Call" status. The "Public Working Draft of WCAG 2.0 (May 2007)" (W3C, 2007c) aims to address all major points of criticism. In a welcome move towards clarity and transparency of process, the WCAG working group published its Summary of Issues, Revisions, and Rationales for Changes to WCAG 2.0 2006 Last Call Draft (W3C, 2007d).

Overall, the material contained in the suite of WCAG 2.0 documents has been shortened and reorganised, resulting in a more logical structure. The technology-agnostic language has been simplified, dropping most of the new terminology introduced by the previous version in favour of common terms (although their definitions have been broadened in order to make them more universally applicable). Baselines have been dropped and their underlying idea reformulated in terms of choosing technologies that are "accessibility supported". Rather than requiring users to ensure that their user agent or assistive technology supports all the technologies used in a particular Web site, the onus is now more explicitly on developers to ensure that the technologies they have chosen are, in fact, known to be supported. Markup validation and standards compliance is not a normative requirement, even in this latest draft. The wide range of cognitive disabilities are also not addressed, but this shortcoming is now clearly stated in the guidelines' introduction.

Although this last point generated renewed criticism (Sampson-Wild, 2007), the May 2007 version of WCAG 2.0 has generally seen positive reception in the accessibility community (Lauke, 2007). Even vocal critics of the previous "Last Call" such as Joe Clark have expressed their increased confidence in the direction of the new guidelines.

3. THE ROLE OF CONTEXT

Within the WAI WCAG guidelines accessibility is understood to mean making content available and helping people find information more quickly by making it understandable and navigable. This is well and good where the information design task is to convey information as clearly and quickly as possible, such as for example company accounts, train timetables, DIY assembly instructions and so on. In these examples the role of the user is simply to find and understand the information presented. But there are many situations where users are expected to take a more active role.

3.1 Advertising

Consider for instance images used in advertising. Often these are deliberately complex and ambiguous, overlaying several different messages to appeal to a wide range of emotions and audiences. These images are designed to be actively interpreted by the viewer and the meanings they convey will be subtly personalized by the different people viewing them as they interpret them through the filters of their own experiences, preoccupations, values and beliefs.

Figure 1. Advertising image (taken from http://www.pvh.com/Brand_CK_Intro.html)

WCAG guideline 1.1 exhorts designers to provide a text equivalent for every non-text element to accommodate those with visual impairment. What would that mean in the advert shown in Figure 1? A text that described the image literally would probably not be very helpful. The whole point of the advert is to let the viewer experience the subtlety of the complex layering of information for themself. So the idea of providing a text alternative just for this image in isolation is probably inappropriate in this instance. If the image is presented in the context of a Web page, it may be possible to create an equivalent experience, for instance through tone and language of the accompanying text. However, it may be that we have to accept that in the Web environment there are occasions when there is no alternative equivalent experience.

3.2 Art

The problem identified here is even more acute when we consider works of art. Take for example Figure 2.This image is so well known that it might be sufficient to simply name it an alt attribute as "The Mona Lisa". But not everyone is familiar with this painting. There has to be a first time when each of us encounters it. What if we were visually impaired? Would the title do justice to the image? We could try to describe it, but "painted portrait of slightly smiling young woman with long hair in front of rural landscape" is not much better, at least not if the context is an art appreciation class. What is important about this picture? There may be as many interpretations as there are viewers, depending on their perspectives and motives for examining the picture: artist? historian? fashion designer?

Figure 2: Mona Lisa

At least the Mona Lisa is a recognizable image. Consider Figure 3. How could you describe it meaningfully to someone unable to see it? What is it a picture of? What is it about? How helpful is it to know that the artist, Salvador Dali, called it "The Great Masturbator"? As with the advertising example, what this is a picture of is probably less important than how it makes you feel. But how successfully could you sum up your feelings about it in an alt attribute?

Figure 3: "The Great Masturbator" by Salvador Dali

3.3 Teaching and Learning

We have seen how ambiguity and interpretation are important in commercial and cultural contexts. What about education and training? At least here we might imagine that information should be presented as clearly as possible. But again it depends on the context. While a lot of learning is factual, it is widely recognised that knowledge is not simply transmitted from one party to another. It is constructed by the learner through some process of interaction with the information. So, while there will be occasions when it is important to convey information unambiguously (for example Figure 4 shows what a healthy cell looks like compared with a cancerous cell), at other times it will be important to be less explicit (can the learner tell if another, different, cell is cancerous?).

These simple examples have big implications for the way we think about accessibility. Clearly, it is a mistake to slavishly follow the guidelines. We need to think about the context of use and in particular consider it from the perspective of the user. What are they likely to want or need to be able to do? And how can we best provide for those needs? In other words, we need to take a more holistic view, focusing on the accessibility of the experience in totality rather than merely thinking about the accessibility of the information resources in isolation.

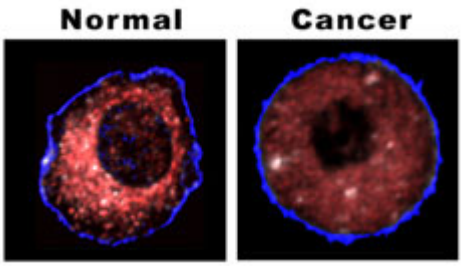

Figure 4: Normal and Cancerous Cells (Reproduced with permission from http://www.sandia.gov/news-center/news-releases/2005/images/mitopic_nr.jpg)

From this perspective the WAI's argument on "Why Standards Harmonization is Essential to Web Accessibility" (W3C, 2006b) can be counter-productive: the application of harmonized standards may be desirable if other factors are equal, but not if this approach overrides the contextual aspects illustrated in this section.

4. A HOLISTIC APPROACH

4.1 A Holistic Model for E-learning Accessibility

We have described a holistic approach to e-learning accessibility previously (Kelly, Phipps and Swift, 2004) (Sloan, Kelly *et al*, 2006). This holistic approach sought to address the limitations of the WAI approach and to address the need to address the accessibility of the learning outcomes, rather than focusing on the accessibility of the e-learning resources. It recognises that other contextual aspects also need to be addressed, including pedagogical issues, available resources, organisation culture, and usability, as discussed previously). This holistic approach focuses on the accessibility of the outcomes of a service, departing from the traditional approach which addresses the accessibility of the service itself. The change in the emphasis from the creator of Web resources to the end user surfaces another tension: the context of use of the resource. The traditional approach has been to follow WCAG guidelines for the Web resource, in isolation of the use of the resource. Inverting this approach can lead to greater challenges for the Web developer, who will need to gain an understanding of the way in which the service is to be used and the wider issue related to its intended purpose.

4.2 The Tangram Model

In addressing the limitations of applying the WAI model for Web accessibility within the context of e-learning, exploring a holistic approach to e-learning accessibility led to the development of a Tangram metaphor (Sloan, Kelly *et al*, 2006) illustrated in Figure 5. This metaphor is used to imply an extensible, multi-component solution to accessibility that will vary depending on situation: as well as WAI guidelines, other guidelines may also be used, such as Nielsen's usability heuristics (Neilson, 1994)**Error! Reference source not found.**, guidelines for design for specific user groups, such as older people (National Institute on Aging, 2002) or guidelines on clarity of written content (The Plain English Campaign, n.d).

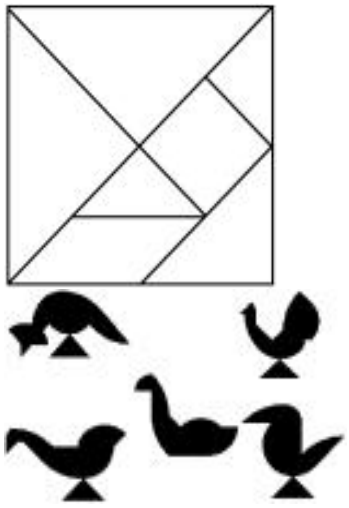

Figure 5: Tangram Metaphor

The aim of this approach is to provide a solution which maximises the usefulness to the end user, as opposed to the current WAI approach which encourages mandatory application of a limited set of guidelines. The metaphor is meant to clarify that the most appropriate solutions can be obtained by engaging with the users rather than simply applying a set of rules.

We can see several advantages in the application of this model:

- The model can be extensible (we can make use of additional 'pieces'). This allows the approach to be extended as, for example, new technologies become available (e.g. guidelines for use of accessible Macromedia Flash or PDF can be incorporated).
- The model can cover general IT accessibility and is not limited to Web accessibility. This is particularly valuable given the accessibility implications of the anticipated convergence of Web and broadcast media, and resultant changes in access and delivery methods (Carey, 2005).
- The model can be extended to include real world solutions instead of constricting usage to poorly supported or commercially impractical technologies.
- The model can be extended to include accessibility issues which are not covered in WCAG (e.g. the accessibility of hard copy output of Web pages) which extend beyond traditional Web-based delivery.
- The model can be deployed across different legal systems.
- The model is neutral regarding technologies.
- The model is well-suited for use with Web resources which are personalised though use of accessibility metadata such as IMS Accessibility Metadata (IMS, 2004) (the model emphasises the service provided to the end user rather than individual components).

5. A STAKEHOLDER MODEL

5.1 Developing a Stakeholder Model of Accessibility

A parallel activity in attempting to address the problem of a fixation by accessibility practitioners on

'compliance' with some form of accessibility 'rules' (often WCAG) has resulted in the development of the Stakeholder Model of Accessibility. This was driven by the need to expand thinking beyond that of how to comply with rules, towards how to meet the needs of disabled people, within the local contexts that users and their support workers are operating. This work has resulted in a contextualised model of accessibility practice, drawn from the context of higher education (Seale, 2006a) (Seale, 2006b). This contextualised model of accessible e-learning practice in higher education takes into account:

- All the stakeholders of accessibility within a higher education institution.
- The context in which these stakeholders have to operate: drivers and mediators.
- How the relationship between the stakeholders and the context influences the responses they make and the accessible e-learning practices that develop (see Figure 6).

The extent to which e-learning material and resources are accessible will therefore be influenced by how all the stakeholders within a higher education institution respond to external drivers for accessibility such as legislation, guidelines and standards. In addition, however, this response will be mediated by stakeholders views and understandings of a range of issues including: disability, accessibility and inclusion; the extent to which they view themselves to have a duty and responsibility to respond; the extent to which they feel their personal autonomy is threatened and the extent to which they feel it is necessary or beneficial to respond as a community or team. The accessible e-learning practices that develop out of these responses will therefore vary depending on the stakeholders and the context in which they are operating but essentially centres on taking ownership and control as well as developing personal meaning (i.e. personal interpretations of the drivers of accessibility, depending on personal experiences and understandings).

A central argument that underpins this model is that accessible e-learning practice will not develop through the actions of individual practitioners or stakeholders. Accessible e-learning practice will develop and progress when all the different stakeholders join to work together. The key stakeholders in the development of accessible e-learning within a higher education institution can be identified as: lecturers, learning technologists, student support services, staff developers and senior managers and of course disabled students (users).

The importance of including disabled students as stakeholders of accessibility can be seen when we consider the results of a number of studies that have evaluated the accessibility of university main Web sites and found evidence of inaccessibility and failure to comply with WCAG 1.0 guidelines (Alexander, 2003), (Spindler, 2004) and (Witt and McDermott, 2002). Without a user-focused or stakeholder approach to accessibility the obvious response to such results would be to continue pointing to guidelines (this has not necessarily worked for WCAG 1.0, why should we assume it will work for WCAG 2.0?) or to place our hopes in new technologies such as Web 2.0 (why should we assume that Web 2.0 technologies will succeed where hundreds of accessibility focused technologies such as repair and filter tools have had limited success?).

We propose therefore that a more fruitful response would be to explore in more depth the students' experiences of e-learning and accessibility and the role that other stakeholders can play in helping to bridge any gap that exists between students and their online learning experiences. In other words, we should stop focusing solely on the drivers of accessibility and turn our attentions instead to the mediators of accessibility.

5.2 Combining the Tangram and Stakeholder Models

There are synergies and overlaps between the Tangram and Stakeholder models of accessibility described in Sections 4 and 5. At the heart of both models are concepts of flexibility, contextualisation and user-involvement. Both models are underpinned by the argument that good design will be mediated by more factors than just a single set of guidelines.

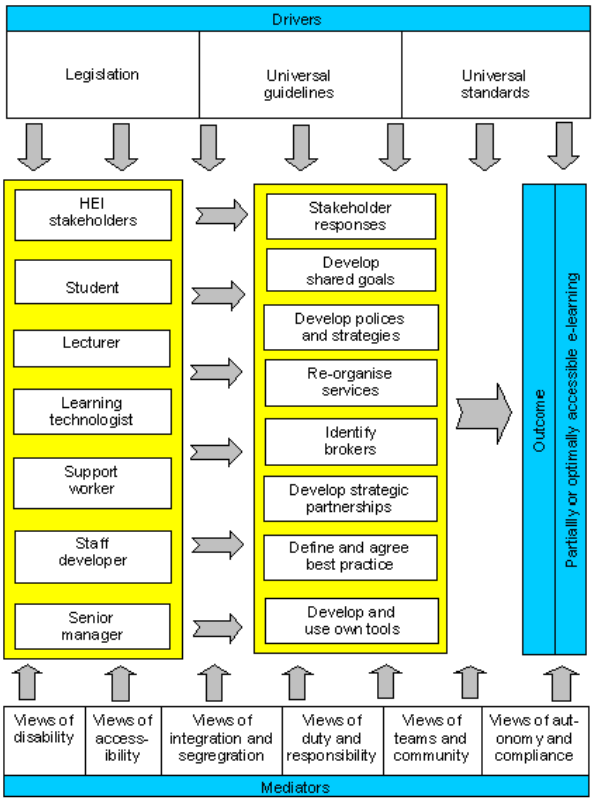

Figure 6: Stakeholder Model For E-learning Accessibility

The accessibility community has tools (legislation, guidelines, standard and policies) but what it lacks is an agreed "way of doing things"- an agreed way of using these tools. The two models of accessibility have been

developed to offer a way forward from this stalemate position, by prompting us to move from trying to find "one best way" towards finding a "range of acceptable ways" that can be adapted to suit different purposes and contexts.

6. APPLICATION IN THE REAL WORLD

We have described a richer underlying framework for accessibility which is based on the Tangram and Stakeholder models. Application of this approach will require a wider framework of activities, including further advice and support for a wide range of stakeholders, extending involvement from just Web developers and policy makers as described in our previous work. Accessibility researchers should also look to how their work can support a contextual approach to accessibility.

In the UK and elsewhere, a philosophy of contextual accessibility can already be seen to be influencing a range of sectors in the way accessibility is considered in design. Some examples are given below.

6.1 E-Learning Example

The contextualised model described in Figure 6 offers generic examples of accessibility drivers and mediators along with stakeholder responses to those issues. In this section we will offer more specific e-learning examples, using two very different contexts or case examples. The first case example is of the Open University in the United Kingdom. The second case example is of the Macquarie Customised Accessibility Service (M-CAS) in Australia. Using the framework outlined in the contextualised model, we will compare and contrast the drivers and mediators in these two cases and identify their influences on stakeholder responses to accessibility issues and potential outcomes.

The Open University

The Open University (OU) is the largest provider of online and distance learning in the United Kingdom (and indeed Europe) and has invested heavily in e-learning over the past 5 years or so (Cooper, 2006).

DRIVERS: There are two major drivers for making e-learning accessible at the OU: the first is the fact that it has around 10,000 registered disabled students, half of which require some kind of learning support. The second is the fact that it has around 400 wholly online courses and a further 190 or so that require some online access. Therefore the scale of making online educational content accessible, presents a particular challenge.

STAKEHOLDERS: Cooper describes five main stakeholders who are playing a role in developing accessible e-learning at the OU: students, course developers, associate lecturers; regional disability advisors and specialist units (e.g. Office for Students with Disabilities; Curriculum Access Team with Disabled Services and the Accessibility in Educational Media Team).

MEDIATORS: The key mediators that appear to be influencing the OU's response to accessibility issues are:

- Views of disability: The view of disability that Cooper argues is being (or should be) generally adopted across the OU is one where it is generally viewed as unhelpful to consider medical classifications of disabilities when trying to work out how best to support disabled students. It is preferable to take a functional approach and consider both the abilities and disabilities of individual students with respect to what they need to make the most effective use of the computer and e-learning.
- Views of accessibility: Accessibility is defined and understood as involving "openness to all" and requiring a focus on learning outcomes (rather than learning materials). It is the learning outcome that must be referred to when determining the best way to make online learning accessible. With this focus, providing alternative or equivalent learning experiences for disabled students is an acceptable way of seeking to meet the same learning outcomes as other students.
- Views of responsibility: At the OU the primary responsibility for accessibility is not devolved to specialist units, but remains with the course team. In addition, all educators are believed to require an appreciation of accessibility issues and an overview of how disabled students may use online learning.

STAKEHOLDER RESPONSES: The two main responses to these drivers and mediators at the OU have been to create a service model whereby specialist services within the OU support course teams in developing accessible learning experiences and to develop staff and professional development opportunities for all educators within the OU.

OUTCOME: Acceptable outcomes for the OU in terms of accessibility of their online material is underpinned by the belief that there are fundamental limits to standard approaches to accessibility: that what is required is appropriate responses to accessibility, where appropriateness is judged primarily on contextual issues: in this case that of learning outcomes.

M-CAS

The OU case example is placed in the context of a single higher education institution working out how best to address accessibility issues internally. In contrast, the M-CAS case example is placed in the context of an external service working out how to best to support the

accessibility needs of students based in a large number of institutions (Kerr and Bainbridge, 2004).

DRIVERS: The two main drivers for the work of M-CAS appear to concerns over gaps in services and cognitive overload of students. M-CAS staff argue that there are still major and significant gaps in the services that individual institutions in Australia offer to students, particularly those with print disabilities and that a consequence of these gaps is that disabled students are required to cope with materials and technologies that place an undue cognitive load on them, a load that other non-disabled students do not experience.

STAKEHOLDERS are identified as students, lecturers, educational consultants, disability liaison officers, technicians and employers.

MEDIATORS: The key mediators that appear to be influencing the OU's response to accessibility issues are:

- Views of disability: M-CAS focuses primarily on blind students and argues that blind students are nor disabled if the barriers to access are removed (a social model approach).
- Views of accessibility: Accessibility is viewed as ensuring equity of access; access to the whole educational experience and is not about a one-size fits all approach. A major focus is on accessibility of material (e.g. conversion from text to Braille), but also involves access to adaptive technologies such as text to speech applications (e.g. JAWS).
- Views of responsibility: For M-CAS, responsibility for accessibility is considered to fall on them, as an external service, when institutions are unable to provide that service themselves. They view this however as supporting rather than replacing existing institutional services.

STAKEHOLDER RESPONSES: The main response to the perceived drivers and mediators that M-CAS face has been to develop a referral service whereby disability liaison officers within an institution can refer students to M-CAS who will then contact the student to discuss their needs and then contact the lecturer to make arrangements for materials to be converted (made accessible).

OUTCOME: Acceptable outcomes for M-CAS in terms of accessibility is that each individual student has their needs met.

There are some key similarities between the two examples. Both the OU and M-CAS have rejected a medical view of disability and have opted for either a functional or social view of disability. In both examples access is understood as involving access to more than online materials. In both cases, specialist services are involved in some way. There are differences however in how those services operate, influenced largely by the different contexts in which they are situated. In the case of the OU the specialist services are run internally, in the case of M-CAS the specialist service is run externally (to higher education institutions). Whilst both specialist services are cited as offering supportive (as opposed to leading or replacement) roles the main focus appears to be different. For the OU the focus is the programme and the tutors who teach on that programme; for M-CAS the focus is the student. The OU focus may be influenced by concepts of universality (e.g. openness to all) whilst the M-CAS approach may be influenced by concepts of individuality (e.g. one size doesn't fit all).

Observers of both services may have their own opinions about which one offers a better or preferable response to accessibility related issues, but what the contextualised model offers is a framework by which we can start to understand how and why different services, institutions and groups respond to the accessibility agenda in ways which may differ from the perceived wisdom laid out in accessibility guidelines, policies and standards. With such a framework we can then start to have a more fruitful discourse with practitioners. A discourse in which we move away from asking "why aren't you doing it the standard way?" towards one in which we proclaim "Tell me why you are doing it that way".

6.2 Institutional Repositories Example

A discussion on the digital-repositories JISCMail list (Kelly, 2006) revealed some of the tensions between different UK stakeholders involved in the provision of institutional repositories of digital resources, in particular repositories of e-prints of peer-reviewed publications. Activists within the open access community have been arguing for the provision of free access to scholarly research publications. The open access movement has been successful in facilitating a wide public debate, in developing a range of technical solutions and in the promotion of the benefits across the academic community.

Many providers of institutional repositories envisage the authors depositing PDF versions of their papers in a repository: an approach which causes concerns regarding the accessibility of the resources. Suggestions that accessible HTML versions of papers should be provided have led to concerns that mandating HTML will place another hurdle in the way which can hinder the move towards greater access to the outputs of the research community. There is a conflict between those wishing to maximise open access by reducing barriers for authors wishing to deposit resources and those wishing to maximise access to resource for people with disabilities.

Our pragmatic user-focussed approach aims to address such tensions, within the context of the host institution. This would require institutions to develop policies and procedures which address issues including:

User engagement: Engaging with various stakeholders within the institution, including

authors with disabilities, disability advisory bodies, etc.

Education: Development of an educational strategy to ensure that depositors of resources are made aware of accessibility issues and techniques for addressing such issues.

Monitoring: Monitoring tools used to create papers and formats used for depositing and prioritising training and technical developments based on popular tools.

Work flow evaluation: Evaluating work flow processes to ensure that accessibility features used are not discarded.

Technical innovation: Monitoring technical innovation which may help in making resources more accessible.

End user support: Development of policies for supporting users who may not be able to access resources.

Engagement with third party stakeholder: Identifying problems in publishers' templates and guidelines and making suggestions on improvements to ensure that papers based on such templates and guidelines will be more accessible.

This approach is intended to avoid the scenario in which an organisation abandons plans to launch a repository which cannot be universally accessible, resulting in a situation which, ironically, is equally unavailable to everyone.

6.3 Mobile Learning Example

How users access and use the Web is changing. Web 2.0 technologies are increasingly seeing a merging of user and contributor through technologies such as blogging (Klamma, Cao and Spaniol, 2007). The devices we use to consume and contribute to the Web are changing. Increasingly there are a myriad of smaller portable devices with access to the Internet, with mobile phones at the forefront of this diversification. Mobile phone ownership is near ubiquitous, it far out numbers PC ownership at some estimates by three to one (Stone, 2004). With improvements in access to the Web on mobile phones and a decrease in prices, it is not hard to imagine a situation where small device access to the Web becomes the primary method of Web usage.

This has implications for accessibility. Developers seeking to conform with WCAG 1.0 are concerned with its limitations in enhancing the accessibility for learning on mobile devices (Kukulska-Hulme, 2007). For many good reasons WCAG 1.0 relies on the implementation of standards, the problem is that the world of small devices is changing so rapidly that standards are hard, if not impossible to maintain. The W3C has responded by producing the Mobile Web Best Practices 1.0 and compared them to the WCAG 1.0 guidelines (W3C, 2007e). However, this guidance remains in draft form and the release of WCAG 2.0 is widely anticipated, leaving them outdated before completion. They do however provide a useful example of some of the difficulty of producing effective detailed technical guidance in a rapidly changing world. Although there are concerns about the accessibility of mobile phones there actually various assistive technologies available on mobiles, including screen readers that will allow mobile Web access (RNIB, 2007). Mobile Web pages, if well constructed are generally available on any device with a Web browser, arguably providing users with access to materials from a variety of sources (~~Smith, 2007a~~).

Figure 7: Screen shot of XHTML-MP version of Classic Bob Cut

Considering the Tangram and Stakeholder approaches to accessibility a different view of mobile phones and disabled access emerges. If mobiles are considered one of many avenues of access to user experience then the accessibility requirements do not lessen but they change. The remainder of this case study is based on the original Alt-N report by Smith considered how content can be delivered onto mobile devices (Smith, 2007b). This study looked at different ways of bringing the same content to mobile phones using a variety of methods, each with its own merits and challenges.

Smith investigated the methods by which a practitioner, with limited technical knowledge and time, might produce learning objects for mobile phones by adapting existing materials. He used Mimas's Hairdressing Training service (see http://www.hairdressing.ac.uk/) as the source of these materials. The service offers guides on various hairstyles and aspects of the hairdressing industry for students. From his work with Hairdressing Tutors he became aware that access and understanding of the desktop computer systems was low amongst the students and lecturers but that access to mobile phones was high. Additionally, given the vocational nature of the subject he was keen to explore ways that would allow students to easily bring reference materials into the salon, where some of the learning would take place; the mobile phone seemed the logical choice. This led him to consider if offering the service via mobile devices might facilitate a useful additional learning path for students. For the prototype work one guide was chosen as the object to be modified – The Classic Bob Cut.

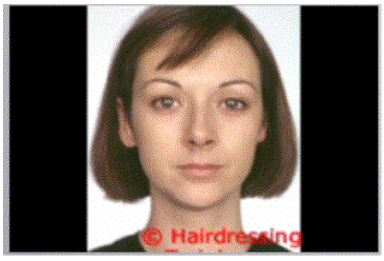

Figure 8. Mobile/iPod video screenshot of Classic Bob Cut

Accessibility of the methods was also considered in relation to UK disability legislation. Assistive technologies for mobile phones are available and in use. However, mobile phones because of their size, cost and portability offer accessibility advantages in themselves for some users. For example, those who might not be able to cope with a bulky laptop may find the size of

mobile phones easier to manage physically. Part of the inspiration for the investigation was to offer students a path to learning via a more familiar device this is sympathetic with the Tangram and Stakeholder models.

The investigation considered the different methods a practitioner might adopt to create an object for a mobile environment and Smith selected three:

1. A mobile version of XHTML-MP combined with CSS, which are used to code Web pages (see Figure 7).
2. A mobile movie format called Third Generation Partnership Project (3GPP) (see Figure 8), as part of this process an iPod compatible version was also produced.
3. A Java Micro Edition (Java ME a.k.a. J2ME) and XML based content creation tool called Maxdox (see Figure 9).

Although since the research was initially carried out it seems that Maxdox have gone out of business, the concept of using Java ME with XML to produce electronic guides for mobiles still holds, the attraction of Maxdox for the original research was the ease of use of the tool and its free availability for education.

The challenges faced included the difficulty of testing since each mobile phone Web browser and other technologies will vary between models and mobile service providers may also adapt each model for their market and the costs associated with use of mobile phone networks. However the availability of Bluetooth (a wireless connectivity technology) may help educators address these problems. It would be feasible, for example, to set-up a computer in a lecture theatre and have it transmit mobile compatible learning materials during a presentation to students with the appropriate devices.

Transmission of materials via Bluetooth could also be complemented by using WiFi to broaden the range of devices able to receive materials. These materials would, naturally, have to be operable on each device. Of course, this would also raise the issue of allowing students to leave these devices switched on and to interact with them during a lecture; this would require a cultural change in how some educators operate and perceive mobile phones and portable computers (Smith, 2007c).

As expected, each method offered advantages and disadvantages such as:

- XHTML-MP and CSS offered the greatest flexibility. If carefully created using templates, the resulting objects will be available on any device with a compatible Web browser, including desktop computers. However, this does require that the content producer is comfortable with coding the mark-up and style sheets, since "What You See Is What You Get" Web editors will not be sufficient.
- Maxdox allows rapid content creation with little coding knowledge, as Wizards and existing templates can be used. Additionally the entire object can be easily downloaded to a compatible phone, which means a constant network for use is not required. However, if the supplied templates are not sufficient then a content creator will have to come to grips with XML coding and a deeper understanding of the tool and its use of Java. It can also be difficult to test a range of devices for compatibility but this only needs to be undertaken once for each template.
- Mobile video allows rapid content creation if adapting existing content. The creation tools are widely available and supplied as standard with most modern computers. Another advantage is that, once created, the raw files can be exported into various versions, such as for the iPod or desktop computer. However, playback on a mobile phone can be problematic since it is a very linear experience and options such as fast-forward and rewind are not always easily available.

Figure 9: Maxdox emulator screenshot of Classic Bob Cut

The wider adoption of some or all of these methods, as well as others such Adobe's Flash Lite or Scalable Vector Graphics allows the delivery of wide range of materials to mobile devices. Ultimately it is not intended that every user will access the content of their preference through mobile devices but the option is increasingly available and for some users this might be the most accessible choice.

6.4 PAS 78 – Adopting Contextual Accessibility in a Standard

In March 2005, Publicly Available Specification 78: Guide to Good Practice in Commissioning Accessible Websites (PAS 78) was launched in the UK by the British Standards Institute (BSI, 2005). It deviated from a typical 'standard' for Web accessibility in that it sought to promote a standard method of *procuring* accessible Web content, rather than designing accessible content. The standard emerged as a solution to the technical interpretation of accessibility guidelines

experienced by those who were responsible for the establishment of a Web site, but without necessarily having the knowledge to:

- Specify a level of accessibility to be met, and
- Assess the delivered Web site for adherence to the specified level of accessibility.

While not related to the work described by the authors, the emergence of PAS 78 is relevant and of interest because:

- The nature of the document is such that it has to concentrate on a *process* that results in an optimally accessible Web site, rather than attempt to define a technically-testable level of accessibility.
- The document has a life-span of two years, after which point it is anticipated that a revised version will be necessary in order to update developments in Web, browsing and assistive technologies and formats, as well as emergence and maturation of relevant research and other standards.
- The nature of the document promotes and enables a contextual approach to be taken without mandating compliance with a specific technical standard, although it does strongly promote the merits of WCAG, UAAG and ATAG conformance, In this way, it encourages a more creative approach to choosing an appropriate accessibility strategy for the particular set of circumstances the reader faces.

The emergence of PAS 78 is therefore a complementary to the legislation of the UK's DDA, which concentrates on the obligations of employers, providers of "goods, facilities and services", and educational providers to take the necessary steps to avoid unjustifiable discrimination against disabled people; without mandating what 'reasonable steps' should be.

7. BUILDING ON THE CONTEXTUAL APPROACH

The publication of the first draft of the second release of the WAI Web Context Accessibility Guidelines prompted a flurry of responses, including one by many of the participants from the first Accessibility Summit that had been held in York in 2004. A second summit in November 2006 called on the public sector to rethink its approach to accessibility, utilising WCAG as part of a suite of approaches, rather than a standard with which to comply (Accessibility Summit, 2006). The participants at the summit expressed the need for accessibility guidelines to focus upon the needs of the user and for technical guidelines to allow such a degree of flexibility to enable approaches that are not necessarily guideline compliant to form part of a range of activities, which, taken holistically, form an accessible experience (to use an obvious analogy – an entrance to a building that is accessible only via steps is not technically accessible, but if there is a ramp to another door a few metres away, the holistic view of 'access to the building' meets accessibility requirements).

As an aid to the process of creating a linkage between technical requirements and a user need focus, the JISC-funded TechDis service have produced the concept of an Accessibility Passport. This is a document which sits with any learning object, and can be accessed openly from anywhere, such as a wiki. This document enables anyone involved in the design, creation, delivery or usage of a learning object to communicate information that would lead to a refined or more appropriate object or usage of the object. Briefly, the designer of a learning object would state the original objective of the object, and the creator would add any issues that the original specification created and any deviations that resulted. Anyone delivering or using the object would then feed back real world examples of the resource's accessibility in action. It may be that a designer fears an object presents certain accessibility barriers, and labels the object as 'unsuitable for people with x need', whereas people who use the object may quickly find a way of using the object that is suitable for people with x need – this information they can feed back into the Passport to enable future users to benefit from their efforts. The point of the Passport is to pass information in plain English between the stakeholders in the life of a learning object to draw out and enhance its accessibility potential.

The original idea for the Accessibility Passport was presented in a poster at ALT-C 2006 (Techdis, 2006). The concept has now undergone a series of iterations such that TechDis are working towards a Passport Generator to streamline the process.

8. ACCESSIBILITY 2.0

We have described the holistic approach to e-learning accessibility and how this approach can be applied in a wider range of contexts, through use of the tangram metaphor and the contextualised stakeholder model, which provides a forum for discussion and debate across the stakeholder community. There still remains a need to be able to communicate the underlying philosophy with the wider community, including those involved in the development of accessibility guidelines, policy makers, accessibility organisations and government organisations.

The 'Accessibility 2.0' term aims to provide a means for articulating a shift in the approaches to addressing accessibility. This term builds on the wide penetration of the 'Web 2.0' term and related terms such as e-learning 2.0, library 2.0, etc. which aim to communicate a step change in approaches.

We can describe the characteristics of Accessibility 2.0 as:

> **User-focussed**: As with Web 2.0, the emphasis is on the needs of the user. Accessibility 2.0 aims to address the needs of the user rather than compliance with guidelines.

Widening participation rather than universal accessibility: The approach taken to Web accessibility is based on widening participation rather than in a belief based on the notion of universal access.

Rich set of stakeholders: In contrast with traditional approaches to Web accessibility, which places an emphasis on the author of Web resources and, to a lesser extent, the end user, Accessibility 2.0 explicitly acknowledges that need to engage with a wider range of stakeholders.

Sustainability: Accessibility 2.0 emphasises the need for the sustainability of accessible services.

Always beta: There is an awareness that a finished perfect solution is not available; rather the process will be on ongoing refinement and development.

Flexibility: A good-enough solution will be preferred to the vision of a perfect technical solution.

Diversity: Recognition that there can be a diversity of solutions to the problem of providing accessible services.

Social model for accessibility: Rather than regarding Web accessibility based on a medical model, Accessibility 2.0 adopts a social model.

Devolved, not hierarchical: Solutions to Web accessibility should be determined within the specific context of use, rather than advocating a global solution.

Emphasis on policy, rather than technical, solutions: Although there are technical aspects related to Web accessibility, Accessibility 2.0p tends to focus on the policy aspects.

Blended, aggregated solutions: Users want solutions and services, but these need not necessarily be a single solution; nor need the solution be only an IT solution.

Accessibility as a bazaar, not a cathedral: The Cathedral and the Bazaar analogy (Raymond, 1998) can be used to compare Accessibility 1.0 and 2.0. The WAI approach is based on complex and difficult to understand sets of guidelines, which results in developments which are slow-moving in responding to rapid technological change.

Accessibility as a journey, rather than a destination: Rather than regarding Web accessibility as something that is solved by providing AAA compliance, Accessibility 2.0 regards accessibility as a never-ending journey, in which richer solutions could always be provided.

Decision-making by broad consensus: Decisions on the extent to which accessibility is supported is determined by a broad consensus as to what is reasonable, rather than WAI's definitions.

9. IMPLICATIONS FOR WAI

This paper has highlighted deficiencies in the WAI approach to Web accessibility, but only in an effort to present a rationale for a new approach to accessibility of Web resources. It should be acknowledged that WAI has been extremely successful in raising an awareness of the importance of Web accessibility and in providing an initial model which has enabled providers of Web services to provide more accessible services. The lively debate on the future of the WAI guidelines reflects the interests of a wide range of communities in building on WAI's initial work.

Despite the problems with the current state of the WCAG guidelines, WCAG 2.0's technology-neutral approach, its foundation on the POUR (perceivable, operable, understandable, robust) general principles, the provision of accessibility supported technologies (which provide contextual solutions based on the end user's technical environment) and the recognition (in the related, non-normative techniques documents) that there can often be more than one solution for passing a success criterion, resonate with the ideas outlined in this paper. We would argue, however, that WAI can provide a more solid set of foundations on which to develop an environment for building more accessible Web services if the following issues are addressed:

Clarifying the WAI model: The WAI model is dependent not only on Web authoring implementing WCAG guidelines, but also software vendors providing UAAG-compliant user agents and ATAG-compliant authoring tools. In addition there is an implicit assumption that the organisations will deploy such tools and end users will make use of them. The evidence since the guidelines were released proves that such assumptions have not been reflected in reality. In the light of such evidence we suggest decoupling the 3-faceted WAI model, with WAI guidelines providing advice on best practices for Web authors, whilst the ATAG and UAAG guidelines provide advice aimed at software vendors. They should acknowledge that, for a variety of reasons, users and authors may not be working in ATAG and UAAG compliant environments.

Clarifying the role of context: The WCAG 1.0 guidelines do acknowledge the role of context in statements such as "Use W3C technologies when they are available and appropriate for a task …". A similar guideline stating "Use WCAG guidelines when they are appropriate for a task …" would be a simple way of recognizing that guidelines may not be applicable based on the context of use. This probably reflects the spirit of the guidelines, but this is not how the guidelines are often interpreted.

Acknowledgment that ultimate goal is accessibility for users:: The Web accessibility guidelines should explicitly state their limited scope in seeking to address the accessibility of Web resources, and that accessibility in a wider context could be achieved using non-Web solutions.

Acknowledging the relevance of diversity: WAI have always emphasised that compliance with

WCAG guidelines need not lead to a uniform interface, and that CSS can be used to provide a diversity of user interfaces which can be accessible. With WCAG 2.0 guidelines being tolerant of a diversity of formats (including Flash and PDF, for example) there will be a need for the guidelines to restate the relevance of diversity in order to make a break with the approaches given in WCAG 1.0.

De-emphasing automated checking: Although WCAG guidelines do emphasise the importance of manual checking, in reality an industry has developed based on use of automated accessibility testing. There is therefore a need to re-evaluate the current approaches being taken and the effectiveness of WAI's outreach activities in this area. It is suggested that the tangram model may provide a useful educational device for demonstrating that automated testing addresses only a small part of the picture.

Refocussing of WAI's education and outreach activities: WAI's education and outreach activities will have an important role in ensuring that the diversity of stakeholders involved in the provision of accessible services have an understanding of the model which underpins the ideas described in this paper.

Engaging with a wider range of stakeholder: WAI's high profile places it in an ideal position to take on a coordinating role with other stakeholders in the development of a decentralised approach to maximising the accessibility, usability and interoperability of digital resources.

10. IMPLICATIONS FOR ACCESSIBILITY PRACTITIONERS

The work undertaken in developing these conceptual models needs to be translated into concrete outcomes, as highlighted by the second Accessibility Summit and discussed further at a Professional Forum on Accessibility 2.0 at the Museums and the Web 2007 conference (Kelly and Brown, 2007) which explored the challenges in taking forward the contextual approaches within a museums context. These include:

- Research to produce accessibility-related evidence on which more informed design decisions can be made. Some such work has already taken place, although it has been argued that this has not impacted on the Web development community as much as it could have (Sloan, 2006). This might include evidence of, for example, assistive technology uptake and usage, and attitudes to and awareness of browser capabilities.
- Developing and publicizing a body of best practice. Through case studies and other descriptions of successes – and failures – of how the Web has enhanced accessibility, this will reify what has until now been best practice that is only implied by appropriate interpretation of generic guidelines.
- There is also scope for standardising aspects of Web design with respect to accessibility, for example in the way that accessibility support and advice is provided to end users who need it most - particularly those for whom a gradual decline in sensory, physical or cognitive capability has led to an as yet undetected deterioration in browsing experience (Sloan, Dickinson *et al*, 2006).
- Outreach to policymakers and the legal sector, such that contextual accessibility is incorporated appropriately in future policy, standards and legislation. The publication of PAS 78 in the UK has shown that this is possible; success in terms of adoption of PAS 78 remains to be seen.

As we move to a more context-driven, process-driven approach to Web accessibility, we anticipate other issues emerging, which will require attention by researchers and practitioners alike. This in turn will lead, we hope, to a better understanding of how the Web can be used to its full potential as an enabling technology.

11. IMPLICATIONS FOR INSTITUTIONS

It has been widely recognised that, for accessibility and inclusivity to become effectively embedded in organisational culture, an overarching accessibility policy is necessary (Urban and Burks, 2006) (WebAIM, 2003). The Stakeholder Model describes how multiple stakeholders within an organisation can work together to improve accessibility in a pragmatic, workable manner.

In the UK, amendments to the Disability Discrimination Act (DDA 2005) extended previous legislation to require public organisations, including educational institutions to develop, publish and implement a Disability Equality Scheme (DES) (DDA, 2005). In short, this scheme obliges institutions to make a public statement of their commitment to improve equality for disabled staff and individuals who engage with the organisation as receivers of services provided by the organisation.

The DES should have been an excellent opportunity for organisations to revisit and extend their approach to ICT and accessibility, putting electronic communication and information provision at the heart of an accessibility strategy without necessarily applying rigid technical accessibility requirements across the board. Further, the holistic approach described in this paper explicitly recommends the use of technology to improve accessibility of information, services and experiences in whatever way is available, appropriate and achievable, and thus ideally suited to an overall (rather than specifically web-focused) accessibility policy.

However, anecdotal evidence from a workshop session on institutional accessibility policy, held in July 2007 at a conference of Web professionals from the UK tertiary education sector (IWMW, 2007), found that there was

very little awareness amongst the attendees of their institution's DES. Further, there seemed to be little awareness of any overarching Web accessibility policy. This is worrying in its own right, in that an effective DES requires all stakeholders to be aware of their specific responsibilities as well as the overarching strategy, and if staff who have an interest in accessibility (as the workshop attendees did) are not aware of their institution's DES, the likelihood that the DES will be effectively implemented by all staff must be questioned. It also indicates that there has been less involvement of ICT professionals with knowledge of accessibility in the development of DESs than might have been hoped for. Discussions uncovered problems relating to resources available to implement, support and monitor accessibility policy, lack of top-level support beyond a vague message of support, and a general difficulty in identifying a minimum baseline of conformance, and how this should be

This illustrates the challenges of implementing any accessibility related policy at institutional level, let alone one that supports a holistic approach. However there is still enormous opportunity for institutions to look to a more holistic approach to implementing an accessibility policy, which may avoid issues relating to 'policing' the absolute level of accessibility of a specific resource, instead focusing policy on the process individuals and groups follow in making what they do as accessible as possible. To do this requires ongoing awareness raising at senior management level, with concrete examples of how a holistic, stakeholder-driven accessibility policy can be effectively applied.

12. CONCLUSIONS

It is clear that current approaches to accessibility must adapt in order to respond to changes in the way Web content is created, provided and accessed. In particular, challenges include the increasingly diverse sources of Web content, and the role the Web plays in a wider context of information, service and experience delivery. There will remain, of course, an important role for technical guidance on what constitutes best practice in accessible Web design. It is equally important that approaches should help to identify where a 'one size fits all' approach may be impractical or inappropriate, and should encourage and support creativity in providing multiple, aggregated routes that together help as many as possible achieve the same end goal.

What we have termed 'Accessibility 2.0' is therefore about codifying best practice in taking whatever steps are reasonable and necessary to ensure that the Web can be used to its potential of enabling access to information, services and experiences regardless of disability. This means creating a framework where technical guidance WCAG 1.0, and potentially WCAG 2.0, has a valid and valuable role to play within a wider context, and encouraging defining context such that it can positively influence the design approach taken. A combination of the Tangram metaphor and Stakeholder model forms an important basis on which a more informed, appropriate approach to accessibility can be taken; it also points us in the direction of current and future activities necessary to continue the development of the Web as a way in which social exclusion can be minimised.

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